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Subject: UW-Green Bay study on tipping fees

Here is the writeup on the UWGB study referenced in Spencer Black's press release and related newspaper articles. Note that it does not seem to have been peer reviewed and published. I believe it was presented at a conference. It came from a master's thesis by a student of Katers, Dawn Walczak.

<<Katers&Walczak.pdf>>

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ANALYSIS OF WISCONSIN MUNICIPAL SOLID WASTE LANDFILLING TRENDS AND THE IMPACT OF RECYCLING FEE INCREASES ON THE AMOUNT OF IMPORTED WASTE

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ABSTRACT: Consolidation and privatization in the landfill industry have forced municipal landfills to compete with larger regional landfills. Regional facilities enjoy economies of scale and expand their operations beyond state borders, creating a network of waste transport and disposal across the United States. Interstate transportation of municipal solid waste has been a contentious congressional issues since the 1980's, with several attempts made to impede the flow of interstate waste. The landmark ruling in the 1994 C&A Carbone vs. Clarkstowne, New York, case declared waste as commerce, and therefore became protected under the United States Constitution. Wisconsin unsuccessfully attempted to regulate the flow of municipal solid waste from outside Wisconsin, primarily from Illinois and Minnesota. More recently, Wisconsin passed a controversial three-dollar per ton recycling surcharge to be added to landfill tipping fees. This fee was challenged by the private sector, but upheld by the state Supreme Court. Data from 2002 indicated that out-of-state waste imports to Wisconsin declined, which some attributed to the increase in the recycling surcharge. In an effort to evaluate the impact of the recycling surcharge, a mathematical model used in conjunction with GIS was developed to determine the effects of recycling surcharge increases on the disposal of solid waste in Wisconsin. Results of the model indicated that an additional increase in the recycling surcharge of $7 per ton could reduce waste imports to Wisconsin by approximately fifty percent while also generating additional state funding to preserve the benefits of waste reduction and recycling.

INTRODUCTION

Increased environmental awareness over the last quarter century has given rise to legislation that has changed the cost structure and infrastructure of the waste disposal industry. Solid waste increasingly moves across state lines throughout the United States and, in some cases, are transported between Canada and the United States. Many legislative and restrictive efforts have attempted to impede the flow of waste from state to state, however, the ruling in the C&A Carbone versus Clarkstowne, New York, case in May of 1994, stated that solid waste is protected under the Commerce Clause of the United States Constitution.

Wisconsin was the first state to establish comprehensive, statewide recycling program, Wisconsin Act 335, which created the infrastructure for recycling. The goal of this effort was to improve the use of public resources in managing wastes and to eventually shift waste management techniques to sustainable management techniques such as source reduction, recycling and

composting. It should be noted that recycling and composting in Wisconsin currently saves the equivalent space of one average sized landfill every 1.5 years, avoiding approximately $48 million in tipping fees (Radke, 2003). However, Wisconsin's landfill tipping fees have historically remained lower than neighboring states, averaging between $34-39 per ton, while Minnesota averages $56 per ton and Illinois averages approximately $40 per ton. Because of this, out-of-state waste shipments to Wisconsin have steadily increased since 1995. In 2000, the amount of out-of-state waste hauled to Wisconsin landfills totaled 1,427,951 tons, triple the amount from 1993 and accounting for 15% of the total waste disposed of in Wisconsin (Chartwell Information, 2002). The amount of out-of-state waste increased further to 1,539,659 tons in 2001 (WDNR, 2002).

Since the implementation of a controversial three dollar per ton recycling surcharge in January 2002, Wisconsin has attracted national attention to the interstate waste issue, as the state attempts to manage recycling programs and reduce the impact of out-of-state waste. The increase in the recycling surcharge was challenged by the private sector, but upheld by the state Supreme Court. Privatization of the solid waste industry is evident in Wisconsin where private firms have constructed large landfills near Wisconsin's mutual borders with Illinois and Minnesota and now control approximately 80% of the remaining landfill capacity. Landfill data from 2002 indicated that out-of-state waste imports to Wisconsin declined from previous levels, which some attributed to the increase in the recycling fee surcharge. In an effort to evaluate the impact of the recycling surcharge, a mathematical model used in conjunction with GIS was developed to determine the effects of recycling fee increases on the disposal of solid waste in Wisconsin.

METHODOLOGY

The study area for this project consisted of the entire state of Wisconsin, Eastern Minnesota and Northern Illinois. The purpose of the mathematical model was to evaluate the impacts of recycling surcharge increases on the amount of waste imported from Illinois and Minnesota into Wisconsin. Although landfills are not required to document the amount of municipal solid waste received per facility, Wisconsin landfill owners and operators reported annual estimates of solid waste volumes received to the Wisconsin Department of Natural Resources (WDNR, 1998-2003). Landfill facilities that received waste from outside Wisconsin, which can be seen in Table 1, were the primary facilities evaluated by the mathematical model.

Transport Cost Model. The most significant waste disposal costs were determined to be driver fees, fuel costs, insurance costs, tractor costs, trailer costs, payload capacity and landfill disposal costs. A series of equations using these variables formed the basis of the Transport Cost Model, which explains the impacts of recycling surcharge increases on the amount of municipal solid waste disposed in Wisconsin landfills as functions of distance traveled and landfill disposal costs.

Table 1: Wisconsin Landfills Accepting Out-of-State-Waste					
	Tons				
Facility	1998	1999	2000	2001	2002
Out-of-state waste from Illinois					
City of Janesville	20,359	19,495	20,476	253	22,905
Onyx Glacier Ridge	3,782	5,032	7,019	11,709	13,969
Kestrel Hawk	112,561	310,053	393,838	526,377	322,503
Mallard Ridge	110,600	23,886	76,151	14,220	75,656
WMWI- Orchard Ridge	242	264	873	1,815	4
WMWI- Pheasant Run	705,800	740,142	612,712	525,908	419,530
Superior Emerald Park	162,422	550	0	0	0
Out-of-state waste from Minnesota					
BFI Waste Systems of NA	55,552	163,519	156,915	176,412	278,267
WMWI-Timberline Trail		4,712	9,564	7,185	7,749
Superior Moccasin Mike	51,761	37,371	0	0	0
WMWI-Orchard Ridge	80	0	15	0	9
LaCrosse County	4,449	10,018	1,310	2,104	9,746
Onyx Cranberry Creek	0	0	0	0	2,821
Onyx Seven Mile Creek	28,961	52,252	148,033	273,676	132,071
TOTALS	1,256,569	1,367,294	1,426,906	1,539,659	1,285,230

*Data Source: Wisconsin Department of Natural Resources Capacity Reports 1998-2003

Supporting documentation from both Minnesota and Illinois provided sufficient evidence to determine the direction of flow from each individual transfer station within the respective regions. This information was used in conjunction with the Transport Cost Model results to accurately review where the potential disposal options for each transfer station were located. As a result of eliminating facilities based upon published state information, the situation arises where a single landfill facility is often used as the best in-state option. Total transport and disposal costs for the out-of-state facilities were then compared to the best in-state option and evaluated to determine the maximum and minimum recycling surcharge increases that would alter the direction of waste flow. This analysis allows Wisconsin policymakers the ability to assess a range of recycling surcharge increases and determine the level that would provide sufficient revenue for the state recycling program, while also diverting a percentage of the out-of-state waste.

For each of the 106 transfer stations located within the study area, distances between landfills in the source state and in Wisconsin were found. Those landfill facilities located in excess of 150 miles, one way from the transfer stations, were eliminated. As a result, each transfer station was listed with several potential disposal options. Using the Transport Cost Model, each disposal option for a single transfer station was then analyzed to determine the Total Cost per Ton of Waste Disposed, Total Transport Cost, and the Total Cost of Transport and Disposal. Although disposal options are subjective, the assumptions were that waste would move along the path of least economic resistance and that private haulers would exclusively dispose of waste at their own facilities or a local municipal landfill. Once the disposal options for in-state and out-of-state landfills

were established, the Transport Cost Model was then used to determine the costs affiliated with disposal, determining which facility would be the best case scenario. If the out-of-state option proved to be the best case scenario, then Equation 1 was used to establish the minimum increase in disposal cost that would make the out-of-state option less economically favorable when compared to the least expensive in-state option.

Recycling Surcharge Increase = (Best In-state – Best Out-of-State)/tonnage (1)

The results of Equation 1 for each of the transfer stations were then utilized to determine the percent reduction in volume of waste imported to Wisconsin as the recycling surcharge increased incrementally, with differences found between Wisconsin and Minnesota because of the differences in transportation distances and tipping fees.

Sensitivity Analysis. The goal of the sensitivity analysis was to identify those variables in the Transport Cost Model that exhibited high and low leverage behavior. High leverage variables are values that have a significant impact on the model system when changed, whereas low leverage variables have a minimal impact when changed (Deaton and Winebrake, 2000). The exogenous variables in the Transport Cost Model, those independent of other quantities within the model, are driver hourly wage, fuel cost, disposal cost, and payload. Due to the absence of a reliable range of reasonable values, driver wage and fuel cost were adjusted over a fixed range of plus/minus 50% (Deaton and Winebrake, 2000). Payload sensitivity is a function of the maximum allowable over-the-road hauling weight of 110,000 total pounds (55 tons), which requires a special permit with an associated fee that was included in the Transport Cost Model. The baseline model consisted of a driver wage equal to $16 per hour, a payload of 30-tons and diesel fuel cost equal to $1.479 per gallon. All other inputs are constants quoted as industry standards or derived from existing solid waste transport models.

RESULTS AND DISCUSSION

As indicated previously, there were differences in the model results between Illinois and Minnesota. For the purposes of this discussion they will initially be discussed separately and then combined for the final analysis.

Municipal Solid Waste Transport from Minnesota. Solid waste disposal in Minnesota is dependent on the willingness of out-of-state landfills to accept waste from the high population areas in Hennepin and Ramsey counties. Four privately operated and one municipally operated landfill in Wisconsin collectively processed 497,833 tons of municipal solid waste from Minnesota. The Transport Cost Model disproved the postulation that large recycling surcharge increases would be would be required to offset the price difference between Minnesota and Wisconsin. Due to the travel costs associated with moving waste from a transfer station in Minnesota to a Wisconsin landfill facility, the price gap decreases as mileage increases. The two facilities that accept the bulk of waste from

Minnesota are both located greater than 80 miles from the Wisconsin-Minnesota border. Therefore, an incremental increase of $6.50 per ton would possibly eliminate more than 50% of the waste transported to those landfill facilities.

Municipal Solid Waste Transport from Illinois. The lack of adequate space, expensive land prices and community outrage toward landfill construction around the major metropolitan area of Cook County, Illinois, has led to repeated capacity shortages in the Greater Chicago Metropolitan Area in northern Illinois. Landfill facilities located in Northwestern Illinois, Indiana and Wisconsin are sought after for disposal of Chicago Metropolitan solid waste to relieve the pressure from capacity shortages and the economic burden of disposing waste. With an annual municipal solid waste generation in excess of 15 million tons in the area, northern Illinois waste haulers deposited greater than 850,000 tons of the waste in Wisconsin landfill facilities.

According to the Nonhazardous Solid Waste and Landfill Capacity Report (20003) for northern Illinois regions, twenty transfer stations handled waste, transporting it to eight major landfills in Illinois and seven Wisconsin facilities. The seven Wisconsin landfills reported receiving a total of 854,067 tons of municipal solid waste from Illinois in 2002. Northern Illinois tipping fees, on average, have remained consistent with those in Wisconsin, however the major facilities in Northern Illinois are located further distances from the generation source (Chicago Metropolitan Area) and their tipping fees reflect capacity shortages and high land costs, resulting in a minor difference in costs compared to Wisconsin facilities. The results of the Transport Cost Model yielded a range between $0.99 and $24.27 as recycling surcharge that would need to be added to the current recycling surcharge to eliminate the entire flow of waste from Northern Illinois. However, an increase above seven dollars per ton may have difficulty gaining support from the public and private sector in Wisconsin, both of which pay the fee. For Illinois, the recycling surcharge would need to be increased by $10 per ton to achieve the same level of out-of-state waste diversion that could be achieved with a $6.50 per ton increase for Minnesota.

Combined Results. The results of the combined Illinois and Minnesota data produces information that can be used to estimate the total out-of-state waste diversion for Wisconsin, as well as a projection of the total recycling surcharge revenue and the recycling surcharge revenue from out-of state waste. These results can be seen in Table 2, which indicates that as the recycling surcharge increases from $3 per ton (the current recycling surcharge level) to $10 per ton the amount of out-of-state waste disposed continues to decrease to a maximum diversion rate of 55% at $10 per ton ($7 per ton increase in the recycling surcharge), while the revenue generated from out-of-state waste actually peaks at approximately $9 per ton ($6 per ton increase in the recycling surcharge) and then begin to decrease as the total tons diverted increases more rapidly. However, it should also be noted that the total revenue continues to increase to more than

triple the current amount of revenue being generated with the current $3 per ton recycling surcharge. However, it should be noted that there would also likely be a reduction in waste disposal from in-state sources as well, because at higher tipping fees there would be greater incentives for source reduction, recycling and composting, which was the original premise of the Wisconsin Act 335.

Table 2: Results of Transport Cost Model Analysis

Surcharge ($)	Tons Diverted from Illinois	Tons Diverted from Minnesota	Total Tons Diverted	Percent of Waste Disposal	Generated Revenue from Out-of-State Waste	Total Revenue Generated from Surcharge from All Waste
$10.00	360,000	345,000	705,000	54.98%	$5,774,000	$64,664,830
$9.00	315,000	280,000	595,000	46.40%	$6,186,600	$59,188,347
$8.00	275,000	240,000	515,000	40.16%	$6,139,200	$53,251,864
$7.00	238,000	190,000	428,000	33.37%	$5,980,800	$47,204,381
$6.00	190,000	140,000	330,000	25.73%	$5,714,400	$41,048,898
$3.00	0	0	0	0.00%	$3,855,678	$21,522,939

CONCLUSIONS

Based on the results of this study, it has been determined that the relatively low landfill tipping fees in Wisconsin, as compared to surrounding states of Illinois and Minnesota, makes Wisconsin an attractive place for out-of-state waste, even with significant transportation distances. In 2002, Wisconsin added a $3 per ton recycling surcharge to landfill tipping fees, which decreased the amount of out-of-state waste disposed by approximately 17% from the previous year and provided funding support for the state recycling program. The Transport Cost Model developed as part of this project determined that an additional increase in the recycling surcharge of approximately $6.50 per ton would reduce out-of-state waste from Minnesota by 50%, while an increase of approximately $10 per ton would be required to achieve the same diversion from Illinois. Overall a recycling surcharge increase of $7 per ton could provide a 50% reduction in out-of-state waste disposal in Wisconsin while also increasing revenue to fund the state recycling program.

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